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TRAPPED RADIATION EXPERIMENT

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The trapped radiation detector (TRD) reported sharp increases in the radiation monitored by this instrument on Jan. 8 and 12 and Feb. 5, recorded the best measurement yet made on the outer regions of the Van Allen belts, and is in excellent working condition to fulfill its primary objective of detecting trapped radiation, if any, at Mars.

This experiment consists of four detectors: three Geiger Mueller tubes and a solid state detector.

Tubes A and B will detect protons greater than 500 thousand electron volts and electrons greater than 40 thousand electron volts.

Tube C will detect protons greater than 3.1 million electron volts and electrons greater than 150 thousand electron volts.

The solid state detector will measure protons in two ranges: from 500 thousand electron volts to 11 million electron volts and from 880 thousand electron volts to four million electron volts. It is not sensitive to electrons.

One of the tubes is identical to one flown on Mariner II to Venus in 1962 and provides a basis for comparing data. The TRD is sensitive to low energy protons and electrons and during the cruise portion of the flight to Mars is recording galactic cosmic rays and electrons.

The TRD made excellent measurements in the outer fringes of the Earth's magnetosphere, the best recorded to date. The readings were made at a distance from Earth as far as 92,000 miles. The final evidence of the influences of Earth was detected at a distance of 104,000 miles.

At approximately 12 million miles from Earth, when the Earth was between the spacecraft and the Sun, it was expected that this instrument and others might detect the Earth's wake formed by the solar wind streaming past the Earth's magnetic field and leaves a trail of radiation and disturbed solar plasma and magnetic fields behind the Earth. This was in a period centered on Jan. 28, and the spacecraft was 200,000 miles above the Sun-Earth line. The TRD did not detect the wake at this time or within a period of three weeks centered on this time. This was the first measurement by the western world to be made as this distance from Earth and in this direction.

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The class two solar flare of Feb. 5 was observed by the TRD. It recorded levels 50 times normal for particles in the upper range of the instrument's sensitivity.

It was noted during this event that the higher energy particles from the Sun had reached their peak and were declining in numbers before many low energy particles reached the spacecraft. It is conjectured that this is because the lower energy particles move more slowly or were deflected more by the interplanetary magnetic field.

Prior to this event the instrument had recorded above-normal readings on Jan. 8 and the 12. These readings have not been associated with any known solar flares but the study of this data is continuing.

In comparison with measurements by the TRD on Mariner II in 1962, the TRD on Mariner IV is recording much less radiation in its transit through interplanetary space. This is believed to be due to the quiet period of the Sun in late 1964 and this year as compared with 1962. Higher energy particles, however, are more numerous than in 1962, as observed by other instruments aboard the spacecraft.

At Mars, the instrument is expected to detect trapped radiation associated with any dipole magnetic field larger than three per cent of the Earth's.

TRAPPED RADIATION DETECTOR INSTRUMENTS

The purpose of this experiment is to search for magnetically trapped radiation in the vicinity of Mars that, if it exists, might be similar to the Earth's Van Allen belts of trapped radiation.

The experiment consists of four detectors, three Geiger-Mueller tubes and one solid state detector, a silicon diode covered with thin nickel foil to exclude light.

The three GM tubes are shielded so that low energy particles can only enter by passing through a window at the end of each tube.

The experiment is located on the top of the spacecraft bus and weights about 2-1/4 pounds.

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